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Summary and Conclusions

The KRRC (an active shooting range) is located approximately 5 miles northwest of Bremerton, Washington, on the Olympic Peninsula. The site consists of a 72-acre tax parcel, of which eight of those acres are used for range activities. Shooting activities have taken place at the site as early as the 1940's, and possibly as early as 1926 (the year in which the KRRC was established).

The IA field sampling event was conducted on June 3, 2011. Surface soil, surface water, and sediment samples were collected as a part of this IA. A total of 27 samples, including four background samples and one QA (rinsate) sample were collected for the IA. All samples were analyzed for SVOCs and TAL metals, while surface water and sediment samples were also analyzed for explosives/propellant residue.

9.1 Sources

Sources of contamination at the site include the impact berms. Impact berms are located at the rifle range, the 50-yard pistol range, and sport pistol ranges 1 through 9. A total of 14 surface soil samples were collected from select impact berms. Sample results from sampled impact berms indicate the presence of both SVOCs and, as expected, TAL metals at significant concentrations with respect to background concentrations. In particular, antimony, arsenic, copper, and lead, and to some extent zinc, were prevalent in impact berms at the site. Although not all impact berms were sampled as part of this IA, it is likely that SVOCs and TAL metals may be present at similar concentrations in the impact berms not sampled. The known volume of impacted soil at the site is as follows: 46.6 cubic yards for the 150-yard rifle range impact berm, 66.6 cubic yards for the 200-yard rifle range impact berm, 664.4 for the 50-yard pistol range impact berm, and 3,283.3 cubic yards for sport ranges 1, 2, and 3 impact berms. Further, the impact berm at sport range 4 is also most likely impacted with a volume of 694.4 cubic yards.

9.2 Targets

Wetlands are present north of the site adjacent to the 50-yard pistol range and sport ranges 1, 2, 3, and 4. Six sediment and two surface water samples were collected from within these wetlands. Results from the surface water samples did not indicate the presence of contamination relative to background concentrations; however, results from the sediment samples indicate the presence of four TAL metals at elevated concentrations with respect to background concentrations. These analytes were also similarly detected in source samples and can be



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attributed to the site. In particular, lead was prevalent in the sediment samples. No SVOCs or explosives/propellant residues were detected at elevated concentrations in sediment samples. Based on sample results from this IA, approximately 0.14 mile of wetland frontage has been impacted by the site; though additional wetland frontage likely has been affected.

9.3 Removal Assessment

Four TAL metals (antimony, arsenic, copper, and lead) were detected in impact berms at the site at concentrations which exceeded screening levels. Lead was detected above screening levels at concentrations ranging from 364 mg/kg (RR02SS) to 53,400 mg/kg (PR03SS). Eight PAHs (benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, chrysene, fluoranthene, indeno(1,2,3-cd)pyrene, and pyrene) had multiple exceedances of screening levels in the impact berms. Benzo(a)pyrene was detected above screening levels concentrations ranging from 470 ug/kg (RR04SS) to 10,000 ug/kg (PR02SS and PR04SS). Additionally, the PAHs benzo(g,h,i)perylene and phenanthrene, which do not have corresponding screening levels, were also present in the impact berm samples at concentrations exceeding background concentrations.

Lead was detected above SQGs in four of the six wetland sediment samples at concentrations ranging from 780 to 1,260 mg/kg. Cadmium was detected in one of the six wetland sediment samples at a concentration equal to an SQG. No SVOCs or explosives/propellant residues were detected in any of the sediment samples collected. Lastly, no analytes (TAL metals, SVOCs, or explosives/propellant residues) were detected in the two wetland surface water samples, with the exception of iron, which was below the water quality criteria.

9.4 Conclusions

Based on the results of the IA field sampling events, it appears that the KRRC site contains sources of CERCLA hazardous substances which are migrating to adjacent wetlands. Sediment samples collected from wetlands at the site indicate the presence of TAL metals at elevated concentrations with respect to background concentrations and at levels exceeding screening levels. Impact berms are the likely source of TAL metals contamination.